

2021: A year of records and historical moments

Carbon dioxide emissions in electricity production reach a minimum of 30 years with the end of coal-based production

- 2021 was marked by the growth in the price of emission allowances on the European CO₂ allowance market and the rise in the price of natural gas, which had a negative impact in electricity prices on the Iberian and European wholesale market.
- Adaptation to the pandemic situation remained prominent, with a recovery in the behaviour of pre-pandemic electricity consumption, but still below the levels of previous years.
- With the clear reduction in electricity consumption in 2020, there was the announcement of the early phase-out of coal-based power plants, which began with the closure of the Sines Plant in January and the Pego Plant in November, also driven by the dynamics of CO₂ emission prices, contributing to a significant reduction in CO₂ emissions in the electricity sector.

What marked the most the year 2021 in the renewable electricity sector?

It is important to recall and highlight that the renewable electricity sector (NES) has had and will continue to play a key role as consumer protection insurance against the sharp rise in electricity prices, as guaranteed tariff electricity production has brought an economic benefit to the system, generating an over-gain for NES and savings for consumers.

At European level, the European Commission (EC) launched the "Fit for 55%" legislative package ("Objective 55"), designed with the aim of boosting Europe's new climate ambition, achieving a 55% reduction in greenhouse gas (GHG) emissions by 25% compared to 1990. A decision applauded by the sector which surprised, from the outset, to define at 40% the new target of incorporating renewable sources (compared to the previous 32%) in the final energy consumption of the European Union (EU). There are 14 pieces of legislation to allow the extension of the GHG reduction target from 40% to 55%, 2022 being the stage for discussion between Member States for the implementation of the final versions.

There was also a long-awaited revision of the legislation of the sector, with the new proposal for a Decree-Law of the National Electric System, which transposed the European Market and Renewable Directives. It is thus ensured that the country monitors the development of the tools necessary to meet the targets to which it has set itself as a Member State.

With the publication of this piece of legislation, promulgated on January 3 by the President of the Republic, it is expected the necessary stimulus to boost the repowering of wind power plants and an important step towards the optimization of the permitting process, which has been one of the main barriers to the development of the sector, among other measures indispensable to the achievement of the 2030 targets.

Also, in 2021 started the pioneer auction of floating photovoltaic solar energy in reservoirs. The bidding, taking place in April 2022, will allocate the exploration of 262 MW of solar energy in seven dams in the country, resulting in the largest floating solar project in the world with 100 MW to be installed in the Alqueva reservoir.

What was the performance of renewable electricity in 2021?

In 2021, all the electro-producing centres in Mainland Portugal produced a total of 46 055 GWh of electricity; 66.5% of which came from renewable sources. This total was mainly supported by wind technology, which represented 29.1%, followed by water technology with 25.7%, biomass with 7.2% and photovoltaic solar with 3.8%.

Electricity production from fossil fuels decreased by 6.4% compared to 2020, due to the closure of coal-burning power plants and high renewable production in the first three months of the year, which ensured close to 80% of electricity generation. There was also a significant increase in electrical production through solar photovoltaic, resulting from the entry into operation of new plants adding 311 MW to the national installed capacity.

Electricity imports should also be highlighted, since compared to 2020, there was an increase in the import balance from 1 455 GWh to 4 738 GWh. However, it should be noted that the value of the 2020 import balance resulted mainly from the reduction in electricity consumption at the beginning of the pandemic, and that the Iberian market has returned to the positive importing balance situation of Morocco, which is outside the European market for CO₂ allowances, a situation that could be addressed with the entry of the Carbon Border Adjustment Mechanism in 2023.

The year closed with a month of high renewable productivity, which ensured 69% of electricity generation, the fourth highest monthly value recorded, surpassed by the first three months of the year, of which we highlight February with 88.5%. This month alone contributed to almost half of the total 100% renewable generation hours throughout the year, recording 495 non-consecutive hours, equivalent to 20 days, corresponding to 1,108 hours in the year. This resulted from a marked hydro and wind production, thus proving the high resilience of the national electricity system to high levels of renewable integration.

What is the impact on carbon emissions?

Between 2008 and 2018, the production of electricity from large thermoelectric plants has been responsible for greenhouse gas emissions that have varied between 10 and 17 million tons per year of carbon dioxide.

With a higher weight of renewable sources and lower coal use, this figure fell to 9 million tons in 2019 and 6.6 million tons in 2020. The year of 2021 is a true record, with an estimated 4.8 million tons of carbon dioxide emissions from large power plants. As mentioned, the coal-burning power plants of Sines and Pego closed, remaining in operation the natural gas combined cycle plants of Lares, Pego, Ribatejo and Tapada do Outeiro.

In total emissions, also including the production of electricity associated with the cogeneration and burning of municipal waste, APREN and ZERO estimate a decrease of 8.3 to 6.2 million tonnes of carbon dioxide, a reduction of around 25%, which is a very significant record. Road transport is now unequivocally the main responsible for carbon dioxide emissions in Portugal.

The reduction of emissions in the burning of coal was 1.4 million tons. It was not greater only because there was a need to exhaust virtually all existing coal in the Pego thermoelectric power plant by November 2021.

These important milestones in the renewable sector have resulted in numerous benefits for society, the economy and the environment, of which we highlight:

- **11.6 Mt of CO₂ emissions avoided;**
- **Savings on fossil fuel imports of €1,979M¹;**
- **Savings on electricity imports of €599M²;**
- **Savings on CO₂ allowances of €553M³,** reflecting the average annual price of allowances of €53.2/tCO₂.

Outlook for 2022

Pedro Amaral Jorge, President of APREN, says that: "In 2021 the first stone of a new chapter of the decarbonisation of the economy and society was launched with the contribution of the energy transition: the new Decree-Law of the National Electric System. With the foundation implemented, it is now necessary to operationalise the improvements and simplifications to the Licensing Process of Renewable Electro producers Centers, define a strategy for the PSEN that allows the true democratisation of electricity production with benefit to the citizens, consumers, communities and companies, and implement the necessary conditions to accelerate the energy transition. It is essential to continue and intensify the electrification, direct and indirectly, of energy consumption, with social and territorial cohesion".

As for Francisco Ferreira, the President of ZERO, he considers that: "The year of 2021 was a landmark one for the energy transition. It was the end of an era where one of the most decisive fossil fuels in the world – coal - is no longer used in Portugal to produce electricity. It is thus crucial that, in as sustainable a way as possible, to invest in reducing energy consumption, ensuring greater efficiency and in to invest in renewable energy sources implemented in a sustainable way, ensuring new and more jobs and effective decarbonisation".

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¹ Value calculated using the import prices of coal (values until November 2020, DGEG) and natural gas (WorldBank) and the annual production of electricity using these fossil fuels (Data Hub REN).

² Value calculated using Spain's electricity prices (Entsoe) and the amount of imported electricity (REN).

³ Value calculated based on avoided CO₂ emissions and the price of carbon allowances (SENDECO2).